

FP04203-IDS (JP2002-291039)

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SPECIFICATION <EXCERPT>

[0013] In a further preferred embodiment of the present invention, a selection unit is further included to select, from among the respective IDs of the appliances detected by the detection unit, IDs of appliances of a predetermined profile type, and the display unit displays the positional information associated with an ID registered in the appliance list, from among the IDs of the appliances selected by the selection unit.

[0014] According to a further preferred embodiment of the present invention, displayed on the display are, among the detected appliances, the appliances of the predetermined profile type, that is, only the appliances of the same profile type as the appliance with which the user wishes to establish a connection. This allows the user to easily select the appliance with which the user wishes to establish a connection, leading to a significant increase in user convenience.

[0040] The selection list L2 generated in this manner is stored in the memory 4. The contents of the selection list L2 can be updated by re-executing the editing program stored in the program memory 6.

[0041] FIG. 5 illustrates the data structure of the detection list L3 stored in the memory 4.

[0042] As FIG. 5 shows, the detection list L3 contains IDs and profile types associated therewith. Unlike the appliance list L1 or selection list L2, the detection list L3 cannot be created or edited by user's operations, but is automatically created under the control of

the appliance control unit 1 through a selection process (described later) of selecting a connecting terminal, performed at the time of actually establishing a connection.

[0043] Described next is a process using the Bluetooth terminal of the present embodiment, starting from a selection of a connecting appliance to an actual connection.

[0044] FIG. 6 is a flowchart showing the process of selecting a connecting appliance by using the Bluetooth terminal of the present embodiment.

[0045] Initially, when the user instructs via the operation unit 10 a wireless connection by Bluetooth, the appliance control unit 1 makes an inquiry to other Bluetooth terminals that are on standby, based on a selection program stored in the program memory 6 for selecting a connecting appliance (Step S11). The inquired Bluetooth terminals transmit their respective IDs and profile types to the Bluetooth terminal of the present embodiment which has made the inquiry (Step S12).

[0046] Next, the appliance control unit 1 creates a detection list L3 using the obtained IDs and profile types of the Bluetooth terminals with which a connection can be established (Step S13). After creating the detection list L3, the appliance control unit 1 reads the selection list L2 stored in the memory 4 to activate the IDs of the appliances of a profile type indicated by a flag as "1" (select) in the selection list L2, among the IDs listed on the detection list L3 (Step S14) and to activate the IDs of the appliances of a profile type indicated by a flag as "1" (select) in the selection list L2, among the IDs listed on the appliance list L1 (Step S15).

[0047] Next, the appliance control unit 1 reads the appliance list L1 stored in the memory 4, and makes a comparison between the IDs listed on the appliance list L1 and the IDs activated in the detection list L3 so as to determine whether or not there are any matching IDs (Step S16). If there are matching IDs, the appliance

control unit 1 reads associated nicknames, appliance profile icon names, and positional information from the appliance list L1, and causes the display unit 9 to display these items, while alerting that a connection can be established with these appliances (Step S17). The appliance control unit 1 further makes a comparison between the IDs listed on the appliance list L1 and the IDs activated in the detection list L3 so as to determine whether or not there are any IDs that are not included in the appliance list L1 yet activated in the detection list L3 (Step S18). If there are such IDs, the appliance control unit 1 causes the display unit 9 to display them (Step S19). The apparatus control unit 1 further makes a comparison between the IDs activated in the appliance list L1 and the IDs listed on the detection list L3 so as to determine whether or not there are any IDs that are not included in the detection list L3 yet activated in the appliance list L1 (Step S20). If there are such IDs, the apparatus control unit 1 reads associated nicknames, appliance profile icon names, and positional information from the appliance list L1, and causes the display unit 9 to display these items, while alerting that a connection cannot be established with these appliances (Step S21).

[0048] As a result, the display unit 9 displays information about the appliances of a profile type indicated by a flag as "1" (select) on the selection list L2. More specifically, it displays information about connectable appliances (nicknames, icons, and position, or, IDs only) and information about unconnectable appliances (nicknames, icons, and position). Meanwhile, the display unit 9 does not display information about the appliances of a profile type indicated by a flag as "0" (unselect) on the selection list L2. In this state, the Bluetooth terminal of the present embodiment is on standby for an instruction from the user.

[0049] FIG. 7 illustrates an example of the contents displayed by the display unit 9 during standby.

[0050] In the example illustrated in FIG. 7, the display unit 9 displays a floor plan created using an input program of inputting the above positional information, and also displays the appliances with a selected profile type among the appliances already registered in the appliance list L1 (assume, in this case, that TV is selected) on predetermined positions on the floor plan using the associated nicknames and icons. In FIG. 7, appliances 11 and 12 are registered in the appliance list L1 and are connectable among the appliances having the selected profile type. Their nicknames and icons are displayed at the position indicated by the positional information, alerting that a connection can be established with these appliances. An appliance 13 is registered in the appliance list L1 yet is not connectable among the appliances having the selected profile type. Its nickname and icon are thus displayed with a cross thereon at the position indicated by the positional information, alerting that a connection cannot be established with this appliance. In addition, an ID 14 indicates an appliance not registered in the appliance list L1 yet is connectable among the appliances having the selected profile type. Thus the ID alone is displayed outside the floor plan.

[0051] It is to be noted, through not shown in FIG. 7, that of the appliances which should be displayed on the display unit 9, appliances whose nicknames or appliance icon file names are not registered yet in the appliance list L1 are displayed at the position indicated by the positional information by using their registered nicknames or icons only. Further, of the appliances which should be displayed on the display unit 9, appliances whose nicknames and appliance icon file names are both not registered yet in the appliance list L1 are displayed at the position indicated by the positional information by using their IDs. Furthermore, of the appliances which should be displayed on the display unit 9, appliances whose positional information is not registered yet are

displayed outside the floor plan using their registered nicknames and/or icons.

[0052] While such a standby screen is displayed on the display unit 9, the user can click the appliance 11, appliance 12, or ID 14 via the operation unit 10 to instruct a connection therewith. When a connecting appliance is selected in this manner, the appliance control unit 1 transmits its ID and profile type to the connecting appliance (Step S22). This completes the selection of the appliance to be connected with. Upon completing the selection of the appliance to be connected with, authentication is performed between the Bluetooth terminal of the present embodiment serving as an authentication master and the selected appliance serving as an authentication slave. It is to be noted the selection of the connecting appliance is followed by deletion, from the display unit 9, of the display of the floor plan and the icons and so on of the unselected appliances, which leaves only the display of the nickname and icon of the selected appliance.

[0053] FIG. 8 is a flowchart showing an authentication process using the Bluetooth terminal of the present embodiment.

[0054] As FIG. 8 shows, in the authentication process, the authentication master first activates a random number generation unit 7 to cause it to generate a random number, and transmits the random number to the selected authentication slave (Step S31). Thereafter, when the user enters PIN information via the operation unit 10, the authentication master generates a link key by a predetermined algorithm using the random number and the PIN information (Step S32), and encrypts the link key (Step S33). Here, the PIN information which needs to be entered by the user is the PIN information stored in the memory 4 of the authentication slave, and if PIN information different from this is entered, the authentication fails as described later.

[0055] Meanwhile, upon receiving the random number (Step

S34), the authentication slave reads the PIN information stored in the memory 4 and generates a link key by a predetermined algorithm using the random number and the PIN information (Step S35). Further, the authentication slave encrypts the link key (Step S36), and transmits the encrypted link key to the authentication master (Step S37).

[0056] Upon receiving the encrypted link key from the authentication slave (Step S38), the authentication master checks the received encrypted link key against the encrypted link key generated in the authentication master (Step S39). If the check shows a match between these link keys, the authentication ends successfully (Step S40). However, if the check does not show a match between these link keys, the authentication ends in failure (Step S41).

[0057] As described, if the authentication succeeds (Step S40), a connection is established between the authentication master and the authentication slave, whereas if the authentication fails (Step S41), they are disconnected.

[0058] When the authentication succeeds and a connection is established between the Bluetooth terminal of the present embodiment serving as the authentication master and the Bluetooth terminal of the appliance serving as the authentication slave, it becomes possible to perform data transmission and reception between these Bluetooth terminals. In this case, when a data file is to be transmitted to the appliance serving as the authentication slave, it is sufficient to drag and drop, using the operation unit 10, an icon indicating the data file to the icon indicating the connected appliance. With this, the data file is transmitted to the appliance serving as the authentication slave.

[0059] As described, according to the present embodiment, the appliance table L1 is referred to for selecting an appliance to be connected with, and not merely the IDs of the appliances, but the

positions of the appliances are displayed on the display unit 9, thereby permitting the user to visually make the selection. This leads to a further increase in user convenience upon the selection of the appliance to be connected with.

[0060] In addition, according to the present embodiment, the selection table L2 is referred to for selecting an appliance to be connected with, and only the appliances of a profile type selected in the selection table L2 are displayed on the display unit 9, thereby permitting the user to easily make the selection. This advantageous effect is remarkable especially when many Bluetooth terminals are present in the connectable range. This leads to a significant increase in user convenience upon the selection of the appliance to be connected with.

[0061] Moreover, according to the present embodiment, the appliance table L1 is referred to for selecting an appliance to be connected with, and not merely the IDs of the appliances, but the nicknames and icons of the appliances are displayed on the display unit 9, thereby permitting the user to visually make the selection. This leads to a further increase in user convenience upon the selection of the appliance to be connected with.

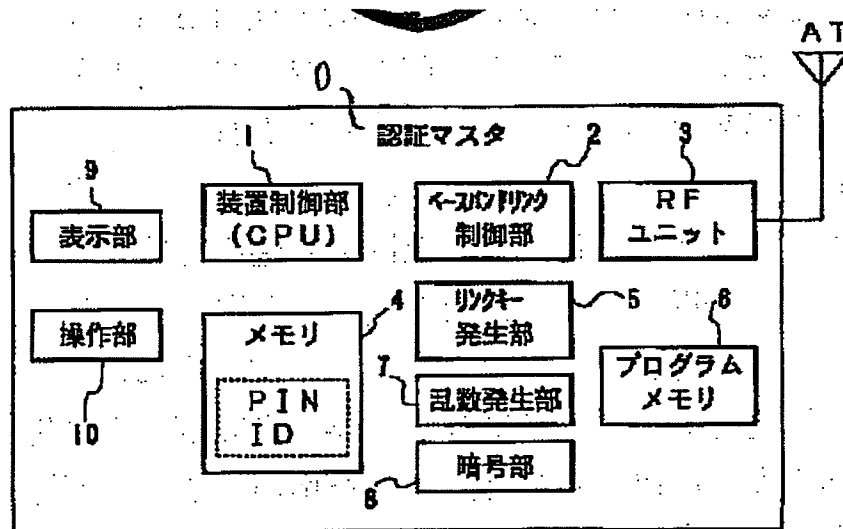
[0062] It is apparent that the present invention is not limited to the above embodiment and many modifications are possible within the scope of the present invention defined by Claims. Accordingly, all such modifications are intended to be included within the scope of the present invention.

[0063] For example, although the above embodiment illustrates the wireless communication between appliances by a wireless communication scheme of a Bluetooth standard, the wireless communication scheme of the present invention is not limited to the wireless communication scheme of the Bluetooth standard, and a wireless communication scheme of a different standard may be employed. Apparatuses to which the present

invention is applicable include personal computers, personal digital assistants (PDAs), workstations, routers, printers, head sets, digital cameras, hard disk drives, removable-disk drives, VTRs, TVs, air conditioners, refrigerators, audio recording and reproduction apparatuses (e.g. tape recorders, IC recorders), remote controls, automobiles, vending machines, microwaves, and telephones.

DRAWINGS

FIG. 1



- 0: Authentication master
- 1: Appliance control unit (CPU)
- 2: Baseband link control unit
- 3: RF unit
- 4: Memory
- 5: Link key generation unit
- 6: Program memory
- 7: Random number generation unit
- 8: Encryption unit
- 9: Display unit
- 10: Operation unit

FIG. 2

0 ~ 機器リストL1

| ID | プロフィール種別 | ニックネーム 2~ | 機器 アイコンファイル名 | 位置情報 ファイル名 |
|------|----------|--------------|-----------------|---------------|
| **** | 1a テレビ | 2a 子供用 | **** | **** |
| **** | 1b 電話機 | 2b (なし) | **** | **** |
| **** | VTR | 2c 古い方 | **** | (なし) |
| . | . | . | . | . |
| . | . | . | . | . |
| . | . | . | . | . |
| . | . | . | . | . |
| . | . | . | . | . |
| . | . | . | . | . |
| . | . | . | . | . |

0: Appliance list L1

1: Profile type

1a: TV

1b: Telephone

2: Nickname

2a: For children

2b: (Not entered)

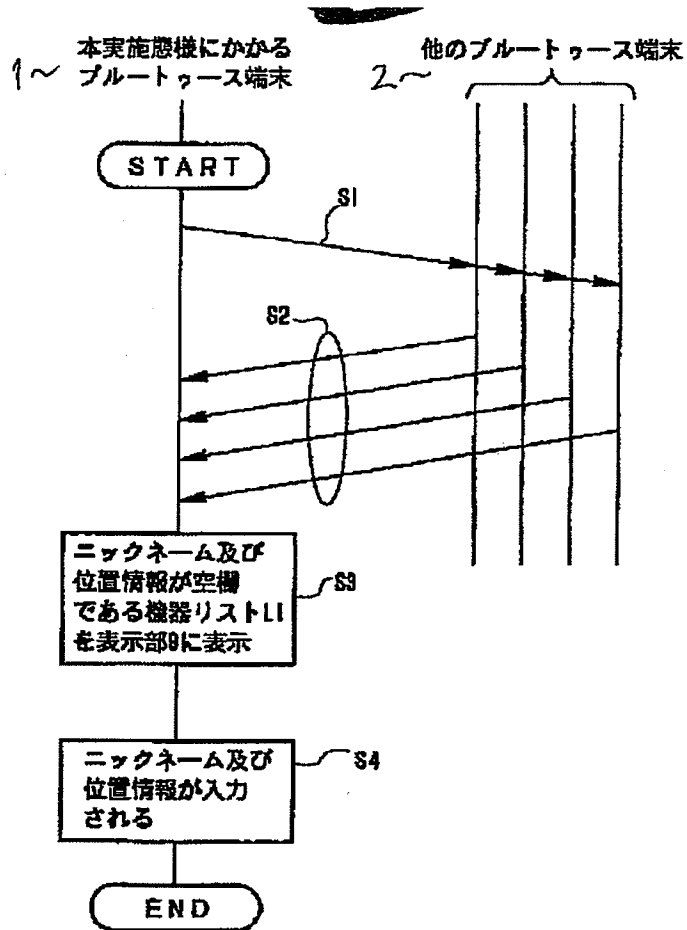
2c: Older one

3: Appliance icon file name

4: Positional information file name

4c: (Not entered)

FIG. 3



1: Bluetooth terminal of present embodiment

2: Other Bluetooth terminals

S3: Display on display unit 9 appliance list L1 with no nickname and positional information

S4: Enter nicknames and positional information

FIG. 4

0 ~ 選択リストL2 ~ 2 3

| | | | |
|----|----------|-----|-----------------|
| 1 | プロフィール種別 | フラグ | プロフィールアイコンファイル名 |
| 1a | テレビ | 1 | ***** |
| 1b | 電話機 | 0 | ***** |
| | VTR | 0 | ***** |
| | . | . | . |
| | . | . | . |
| | . | . | . |
| | . | . | . |
| | . | . | . |
| | . | . | . |

0: Selection list L2

1: Profile type

1a: TV

1b: Telephone

2: Flag

3: Profile icon file name

FIG. 5

0 ~ 検出リストL3 ~

| | | |
|-------|----------|----|
| ID | プロフィール種別 | 1 |
| ***** | テレビ | 1a |
| ***** | VTR | |
| ***** | テレビ | 1b |
| . | . | |
| . | . | |
| . | . | |
| . | . | |
| . | . | |
| . | . | |

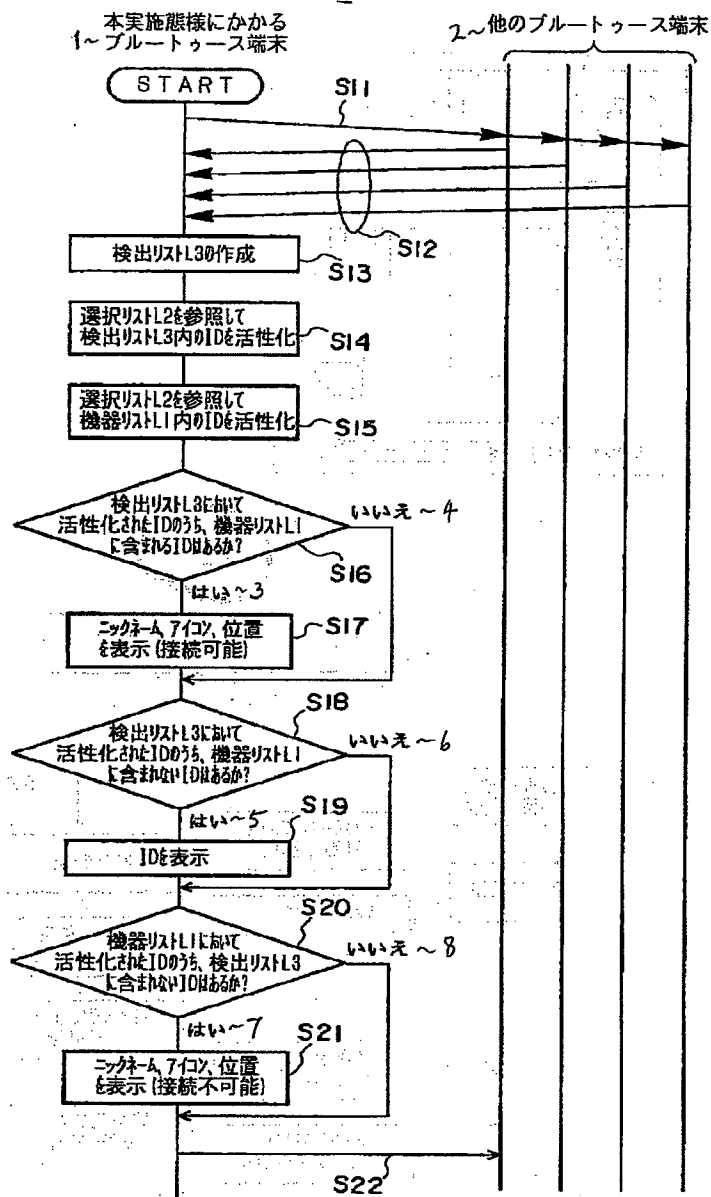
0: Detection list L3

1: Profile type

1a: TV

1b: TV

FIG. 6



1: Bluetooth terminal of present embodiment

2: Other Bluetooth terminals

3: Yes

4: No

5: Yes

6: No

7: Yes

8: No

S13: Create detection list L3

S14: Refer to selection list L2 and activate IDs listed on detection list L3

S15: Refer to selection list L2 and activate IDs listed on appliance list L1

S16: IDs activated in detection list L3 include IDs listed on appliance list L1?

S17: Display nicknames, icons, and position (connectable)

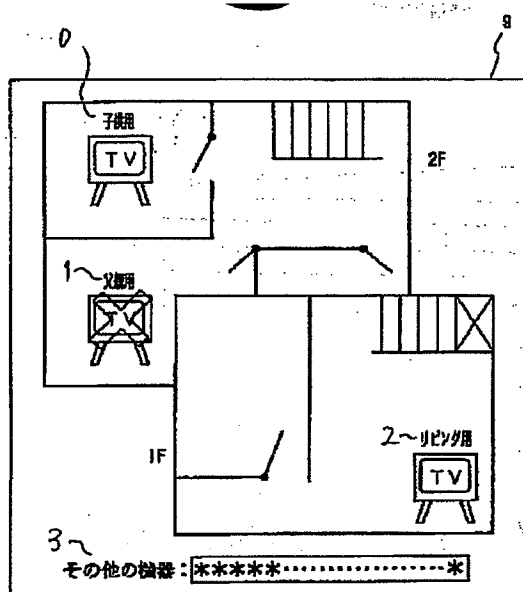
S18: IDs activated in detection list L3 include IDs not listed on appliance list L1?

S19: Display IDs

S20: IDs activated in appliance list L1 include IDs not listed on detection list L3?

S21: Display nicknames, icons, and position (connectable)

FIG. 7



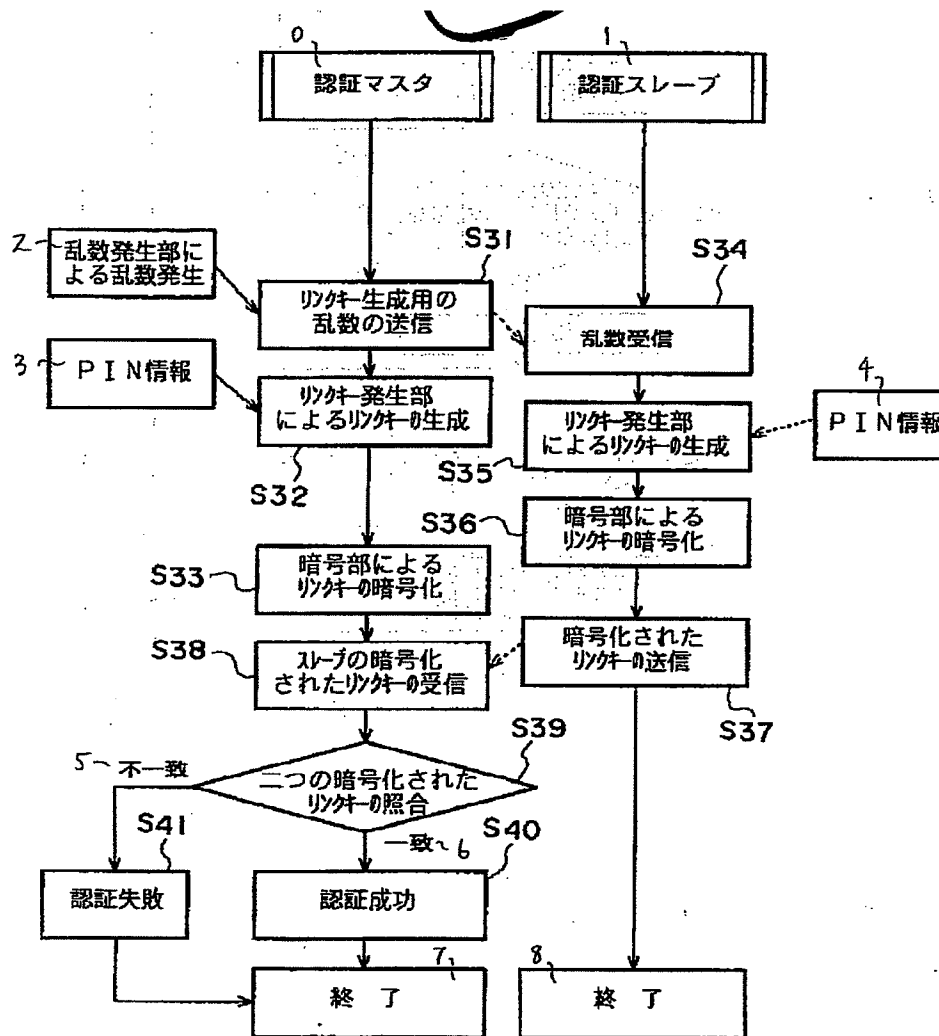
0: For children

1: For father

2: For living room

3: Other appliances

FIG. 8



0: Authentication master

1: Authentication slave

2: Generate random number by random number generation unit

3: PIN information

4: PIN information

5: No match

6: Match

7: End

8: End

S31: Transmit random number for generation of link key

S32: Generate link key by link key generation unit

S33: Encrypt link key by encryption unit

- S34: Receive random number
- S35: Generate link key by link key generation unit
- S36: Encrypt link key by encryption unit
- S37: Transmit encrypted link key
- S38: Receive encrypted link key of authentication slave
- S39: Check between two encrypted link keys
- S40: Authentication successful
- S41: Authentication failure